Hookston Station and Adjacent Areas

Summary of Feasibility Study

July 26, 2006

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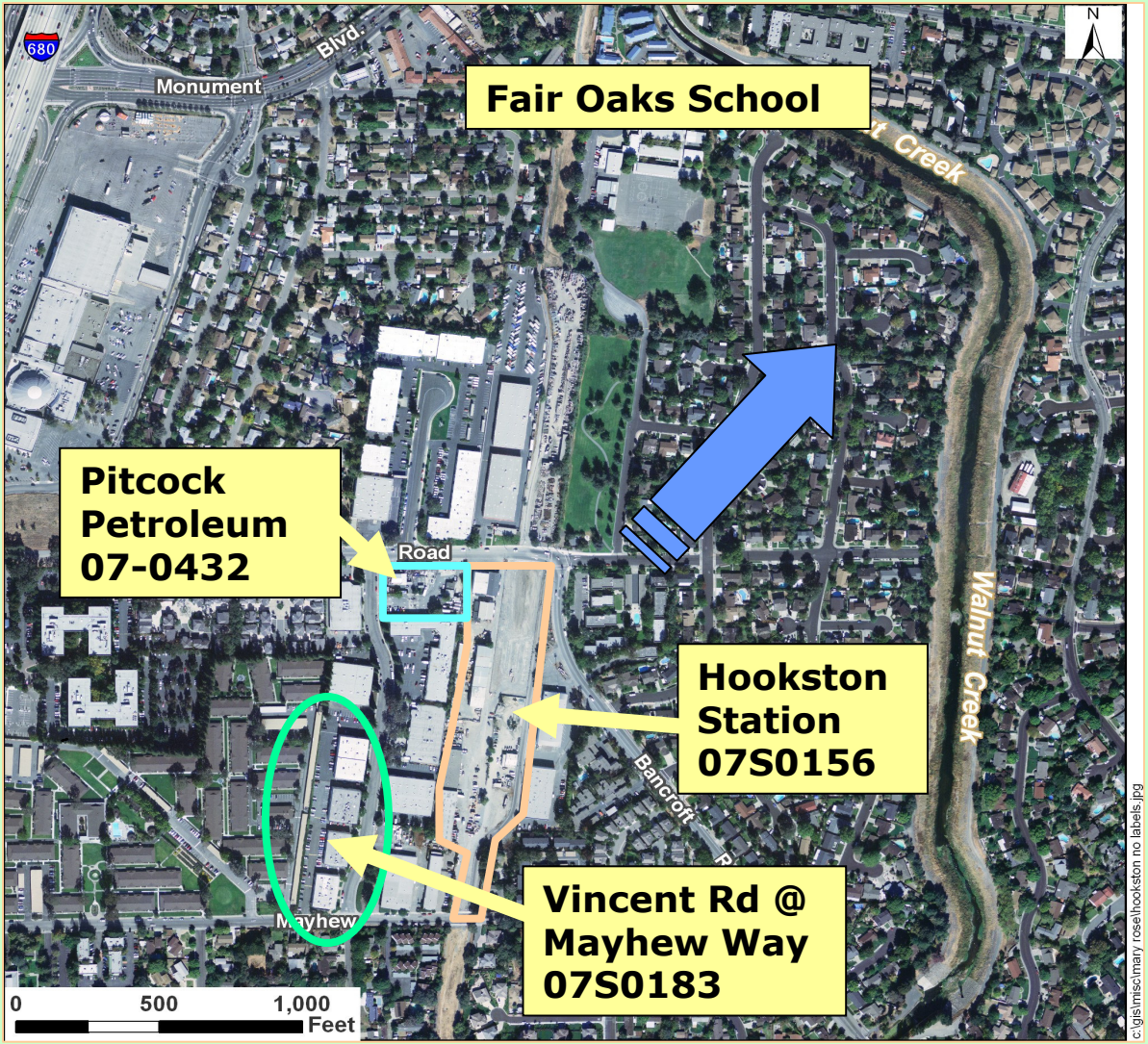
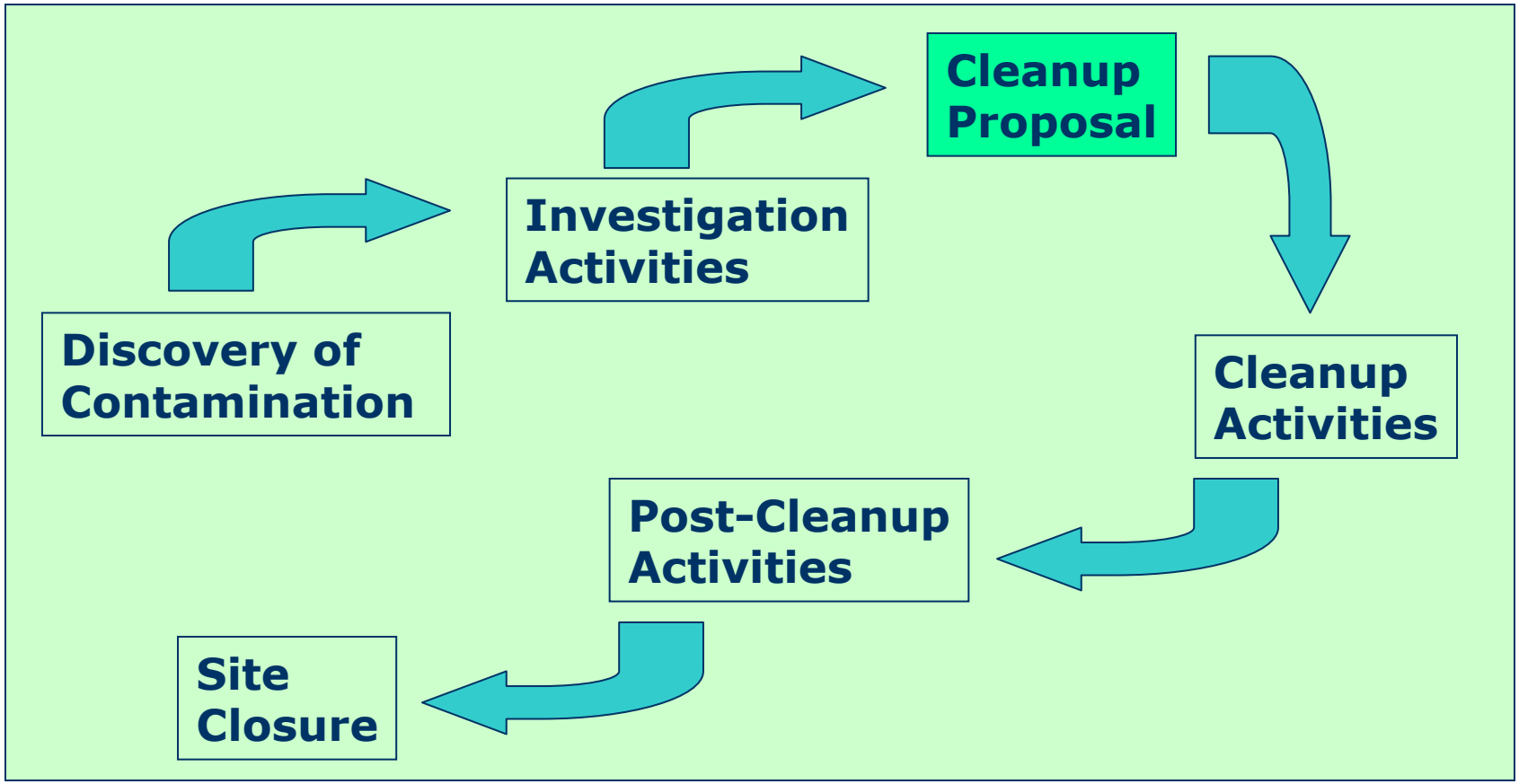
Regional Water Quality Control Board

Vicinity Map



The Cleanup Process



Feasibility Study/Cleanup Plan

- **Initiate Public Comment Period**
  - **August 1-September 1**
  - **Public meeting August 10**
- **Consider comments**
  - **Prepare responsiveness summary**

Community Involvement

- Review Feasibility Study/Cleanup Plan
- Learn about cleanup technologies
- Provide comments
  - August 10 Public Meeting
  - Written (letter or e-mail)
  - Deadline: September 1, 2006

Selection of Cleanup Technology

Based on several factors

- Overall protection of human health and the environment
- Compliance with applicable/appropriate standards
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Short-term effectiveness
- Implementability
- Cost
- Community acceptance

Environmental Concerns Addressed in Feasibility Study

From Baseline Risk Assessment

- Onsite soil & groundwater
- Offsite groundwater
  - Indoor air
  - Non-drinking water
  - Drinking water criteria (long-term)

Preferred Alternative

- Zero-Valent Iron Permeable Reactive Barrier – Zone A
- Chemical Oxidation – Zone B
- Vapor intrusion prevention systems
- Removal of private wells
- Controls to prevent new well installation

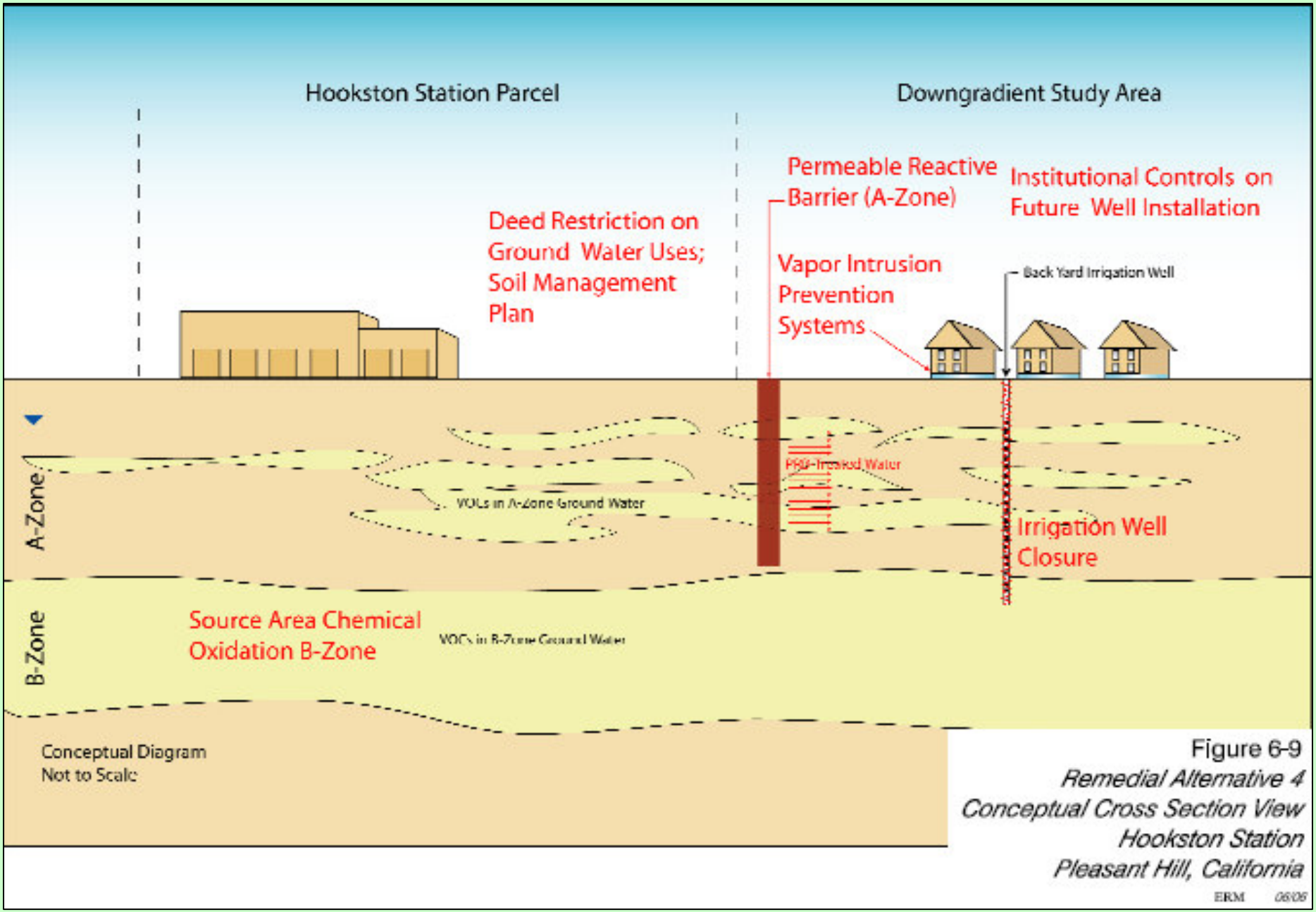
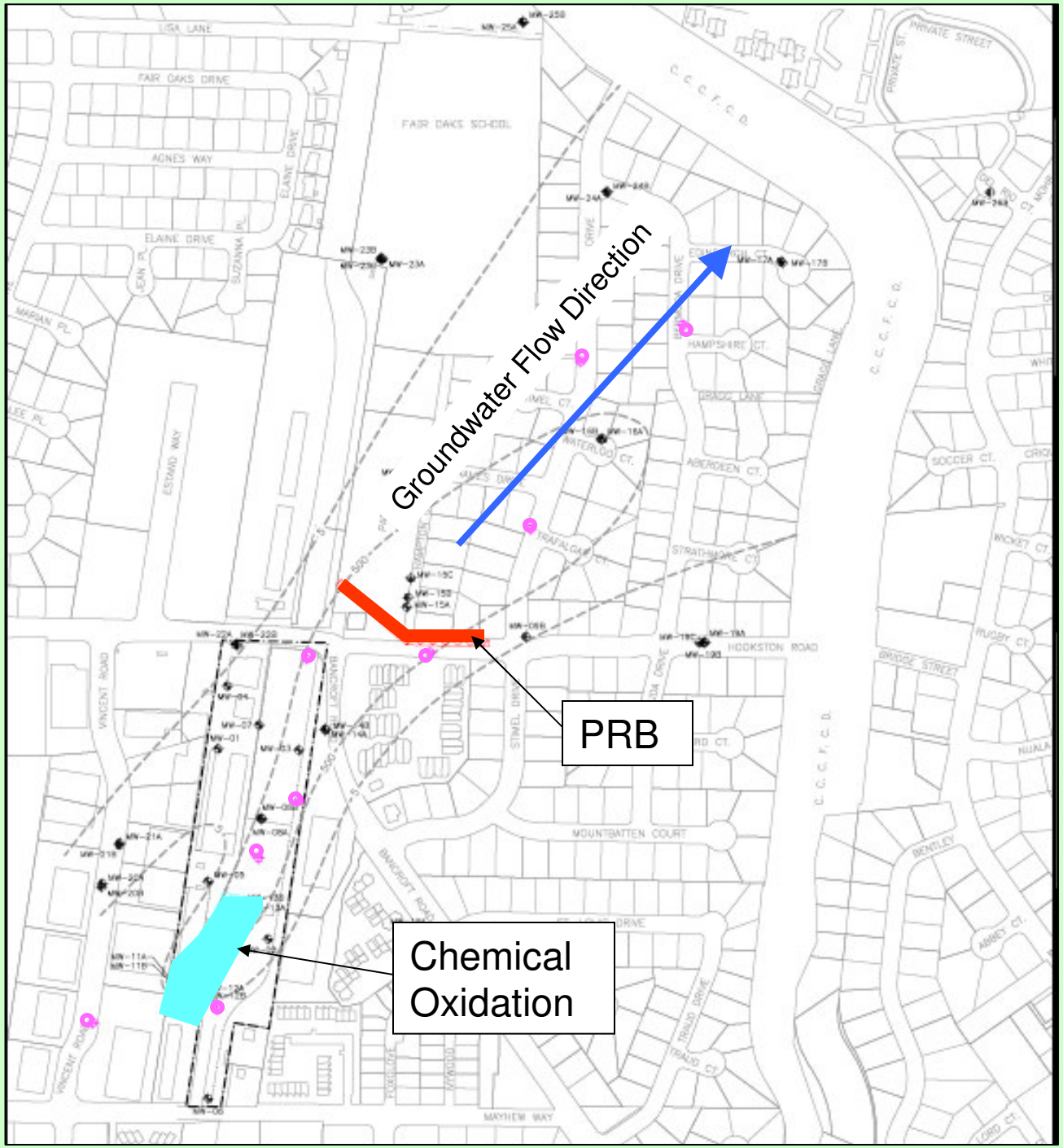


Figure 6-9
Remedial Alternative 4
Conceptual Cross Section View
Hookston Station
Pleasant Hill, California

ERM 06/06


Groundwater Flow Direction
PRB
Chemical Oxidation
FAIR OAKS SCHOOL
HOOKSTON ROAD
MOUNTBATTEN COURT
MAYHEW WAY

Common Elements

Institutional Controls

- **Onsite**
  - **Deed restriction to prevent use of groundwater**
  - **Site management plan to control exposure to arsenic in subsurface soil**
- **Offsite**
  - **Control installation of new wells**

Common Elements (continued)

Short-term Remedy

- **Removal of private wells**
- **Annual indoor air monitoring over the core of the plume**
- **Vapor Intrusion Prevention Systems**
  - **Annual monitoring & inspection**

Common Elements (continued)

Operation and Maintenance

- **Groundwater & soil vapor monitoring**
- **Ensure optimal system performance**
- **Track rate of contaminant mass removal**

Overview of VOC Cleanup Technologies

- **In-situ**
  - **Monitored Natural Attenuation**
  - **Bioremediation**
  - **Permeable Reactive Barrier**
  - **Chemical Oxidation**
- **Pump & treat**

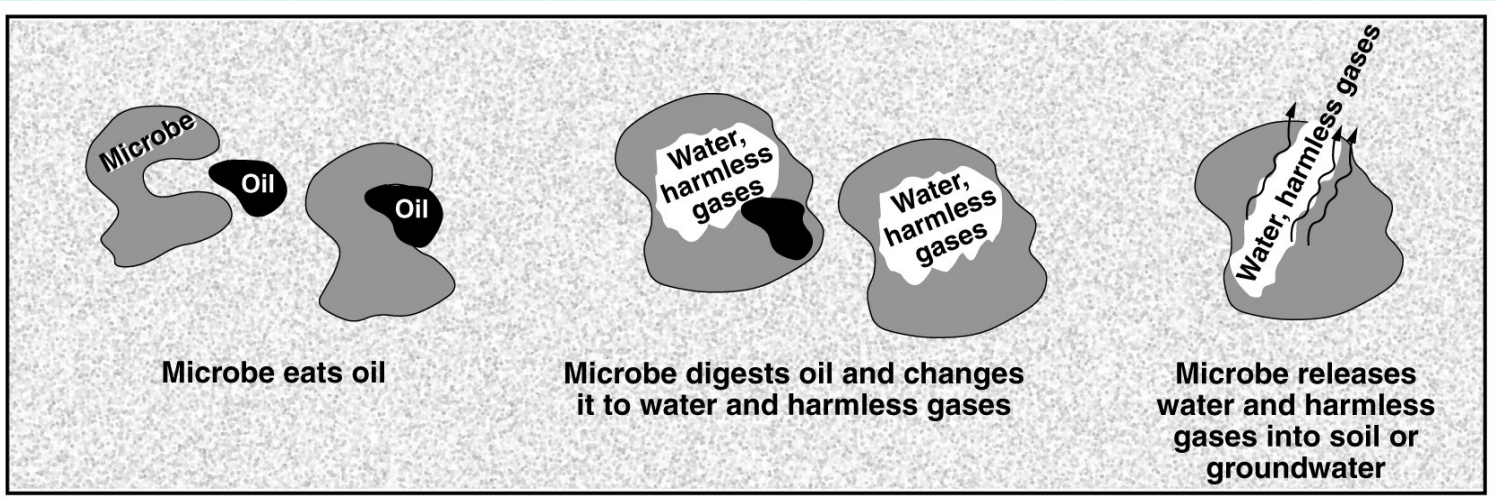
Monitored Natural Attenuation

- ***Process:*** **Natural processes degrade the contaminants**
- ***Required Equipment*****: Extensive monitoring well network**
- ***Advantage:*** **GW not brought to surface**
- ***Disadvantage:*** **Could create more toxic by-products; could take an extremely long time to achieve complete cleanup**

Bioremediation

- ***Process:*** **Stimulate microorganisms to grow and use the contaminants as food/energy source**
- ***Required Equipment*****: Extensive injection and monitoring well network**
- ***Advantage:*** **GW not brought to surface**
- ***Disadvantage:*** **Could create more toxic by-products; could stall**

Bioremediation

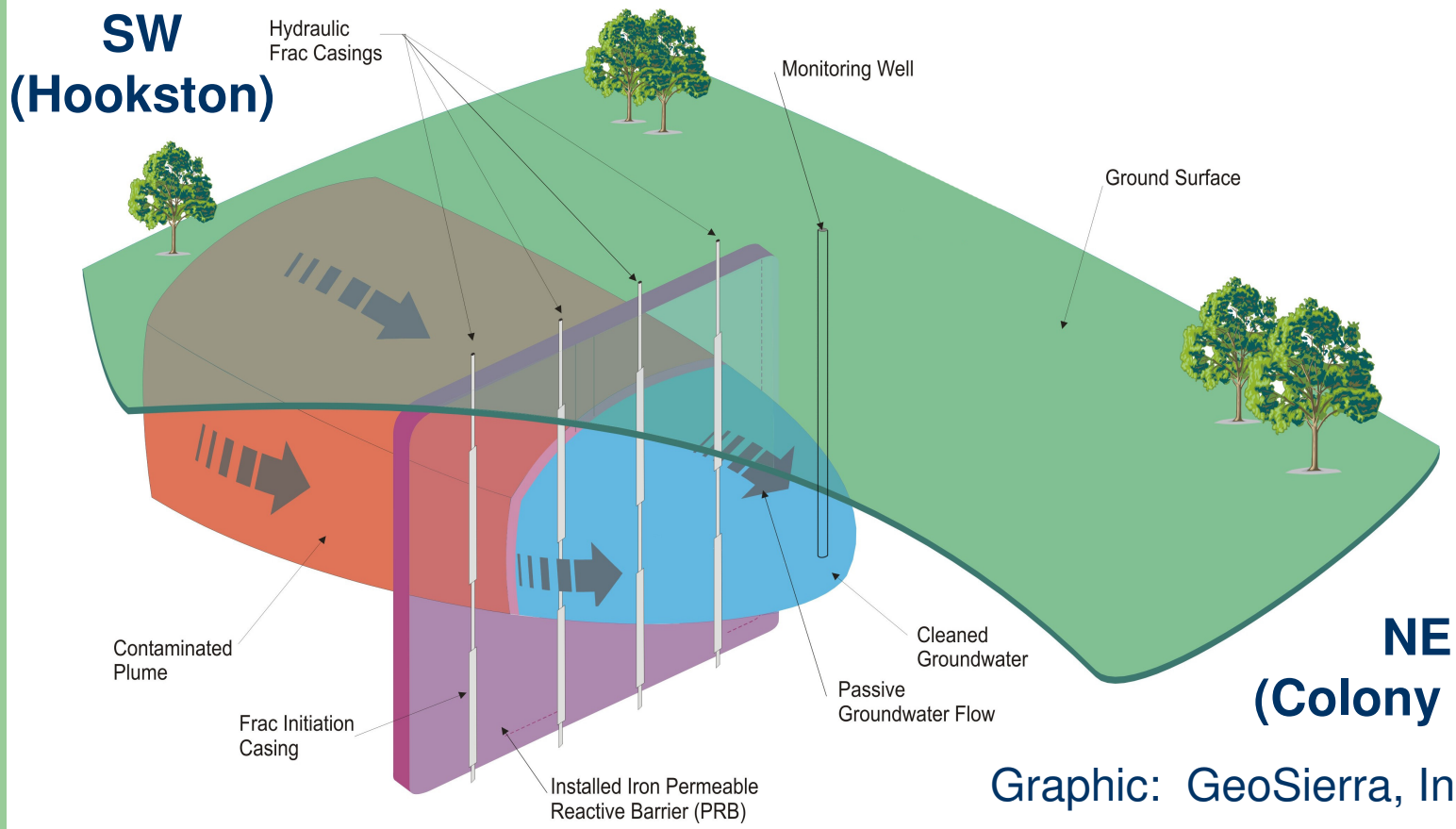


Microbes digest contaminants and release harmless gas

Permeable Reactive Barrier

- ***Process:*** **GW is directed through a chemical treatment zone ("zero-valent iron")**
- ***Required Equipment*****: Trench (300 ft long x 30 ft deep) & monitoring well network**
- ***Advantage:*** **GW not brought to surface**
- ***Disadvantage:*** **Expensive to install; iron particles may need to be replaced**

Permeable Reactive Barrier



Graphic: GeoSierra, Inc.

Chemical Oxidation

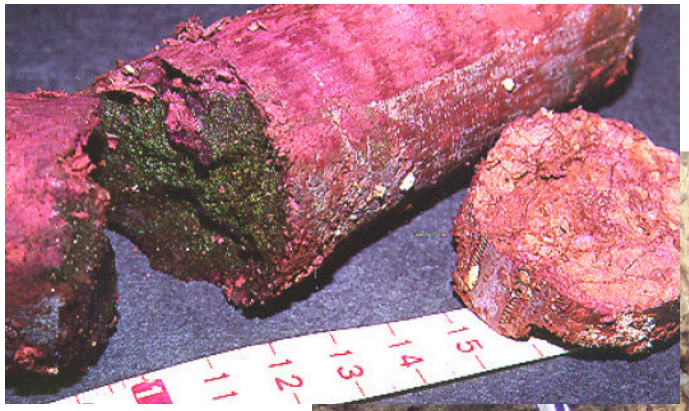
- ***Process:*** **Strong chemical agents (oxidants) introduced into the subsurface to react with the contaminant of concern**
- ***Required Equipment*****: Extensive injection and monitoring well network; 32 tons of potassium permanganate at 150 injection points on Hookston Station Site**
- ***Advantages:*** **GW not brought to surface; may be effective over a shorter time frame than bioremediation; more likely to achieve complete destruction**
- ***Disadvantages:*** **Chemicals require proper handling**

Chemical Oxidation

Potassium permanganate delivered in various quantities from small to large

Chemical Oxidation

Dark purple water in a translucent plastic well sampling device (bailer)



Purple-stained rock core (above)

Purple soil (below)

Pump & Treat

- ***Process:*** **Conveys contaminated groundwater to the surface via extraction wells**
- ***Required Equipment:*** **Extensive extraction well network & piping; treatment system**
- ***Advantages:*** **Well-established technology; easier to control the treatment**
- ***Disadvantages:*** **Expensive; requires pumping and material handling; requires extensive piping system**

Pump & Treat

Extremely high-volume system installed in Napa

Alternative 4 - How Long Will It Take?

Remedy	Time Frame	Comment
Z-V Iron PRB (Zone A)	3-4 years	GW ≤ ESL for Risk to Indoor Air
	30+ years	GW ≤ MCL for Drinking Water
Chemical Oxidation (Zone B)	30+ years	GW ≤ MCL for Drinking Water
Vapor Intrusion Prevention Systems	3-4 years	Turn off when Zone A GW reaches ESL
Institutional Controls	30+ years	Remove when final cleanup goals achieved

Alternative 4 - Proposed Schedule

Activity	Time Frame (estimated)
VIPS Installation & Well Abandonment	9/06-12/06
Hookston Station Site Soil Management Plan	9/06-12/06
Pre-Design Workplan, Implementation, & Reporting	9/06-5/07
Remedial Design	5/07-8/07
Permitting, Utility Clearance, Procurement	8/07-10/07
Implementation	10/07

Next Steps

- Receive and consider comments
- Prepare Tentative Order for Final Site Cleanup Requirements
  - 30-day comment period
- Board adopts Final SCR
- RPs implement pre-design & design phases
- RPs implement cleanup

END